WHAT IS CLAIMED IS:

1. A process for producing an aliphatic oligocarbonate diol comprising
   a) reacting an aliphatic diol with dimethyl carbonate (DMC), in a transesterification, at an elevated pressure in a reaction mixture,
   b) removing methanol and unreacted dimethyl carbonate at a pressure of from I bar to the pressure in a), and
   c) after the reaction of the aliphatic diol and DMC is complete, removing any remaining methanol and any unreacted dimethyl carbonate at a pressure of less than 1 bar, optionally assisted by addition of an inert gas.

2. The process of Claim 1 further comprising adding a catalyst in a).

3. The process of Claim 1, wherein a) further comprises adding the DMC to the diols in a reaction vessel after the reactor is heated and the pressure is applied.

4. The process of Claim 3, wherein in a) DMC is added slowly at first into the reactor, and later the rate of addition is increased to such an extent that a DMC/methanol azeotrope is distilled off in b).

5. The process of Claim 1 comprising adding DMC rapidly in one step in a).

6. The process according to Claim 1 comprising adding up to 100 % of the required amount of DMC to the diol, heating the reactor, applying the pressure, refluxing all the distillate to the reactor until a defined or constant DMC content is obtained in the distillate, distilling off the DMC/methanol mixture and adding the DMC that is lacking compared to the required amount.

7. The process of Claim 1 wherein the elevated pressure in a) is between 1.5 and 100 bar and the temperature is between 100 to 300°C.

8. The process of Claim 7 wherein step b) is performed at a temperature from 160°C to 250°C and at a pressure from 1 to 99 bar.

9. The process of Claim 8 wherein step c) is performed at a temperature from 160°C to 250°C and at a pressure from 1 to 999 mbar.

10. The process of Claim 1 comprising introducing the inert gas as bubbles into the reaction mixture.

11. The process of Claim 1 wherein the inert gas is selected from the group consisting of nitrogen, noble gases, methane, ethane, propane, butane, dimethyl ethers, dry natural gas and dry hydrogen.

12. The process of Claim 1 wherein the inert gas is prepared from a low-boiling liquid selected from the group consisting of pentane, cyclopentane, hexane, cyclohexane, petroleum ether, diethyl ether and methyl tert-butyl ether.

13. The process of Claim 1 comprising removing methanol and unreacted dimethyl carbonate in a gas stream and partially recycling the gas stream to the oligocarbonate.

14. The process of Claim 1 where the total amount of DMC is the sum of the theoretical amount of DMC to be reacted with the aliphatic diol plus the amount of DMC distilled off during the planned reaction time.

15. The process of Claim 1 further comprising d) modification of the molecular weight of the aliphatic oligocarbonate by adding more diol components followed by another transesterification reaction.

16. The process of Claim 1 wherein the aliphatic diol comprises 3 to 20 C atoms.

17. The process of Claim 1 wherein the aliphatic diol comprises an aliphatic ester diol.

18. The process of Claim 17 wherein the aliphatic ester diol comprises an addition product of a diol with a lactone.

19. The process of Claim 18 wherein the lactone is caprolactone or valerolactone.

20. The process of Claim 17 wherein the aliphatic ester diol comprises a condensation product of a diol with a dicarboxylic acid.

21. The process of Claim 20 wherein the dicarboxylic acid is adipic acid, glutaric acid, succinic acid, or malonic acid.

22. The process of Claim 1 wherein the aliphatic diol comprises a polyether polyol.

23. The process of Claim 1 wherein the aliphatic diol is polyethylene glycol, polypropylene glycol or polybutylene glycol.

24. The process of Claim 1 wherein the aliphatic diol is 1,6-hexanediol, 1,5-pentanediol and/or mixtures of 1,6-hexanediol and caprolactone.

25. The process of Claim 17 wherein the aliphatic ester diol is formed in situ during the production of the aliphatic oligocarbonate diol.

26. The process of Claim 1, wherein the molar ratio of diol to DMC in the reaction mixture ranges between 1.01 and 2.0.

27. The process of Claim 2 wherein the catalyst is a soluble transesterification catalyst.

28. The process of Claim 27 wherein the soluble transesterification catalyst is used in concentrations up to 1000 ppm.

29. The process of Claim 2 wherein the catalyst is an insoluble transesterification catalyst.